



Factsheet

MANAGEMENT OF PESTICIDES ON THE FARM

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DISCLAIMER: Nothing in this Factsheet precludes reading each pesticide product label for specific instructions on precautions, first-aid, storage, personal protection and disposal. The label should be consulted.

INTRODUCTION

A pesticide by definition is an agent used "to kill" a pest. Because of the inherent "toxicity" of pesticides, proper safety precautions and common sense should be followed when handling these chemicals. Pesticides should be treated like any other poisonous compound.

The type of pest controlled is reflected by the type of pesticide being used, ie, insecticide, acaricide, herbicide, fungicide, molluscicide, rodenticide, nematocide, etc. Pesticides may selectively control specific pests or be non-specific and control a number of different kinds of pests. The label will list those pests that are reliably controlled. Many pesticides can be harmful to non-target plants or animals depending on their mode of action. Hence, an insecticide may kill fish, poison domestic animals or affect the health of humans if handled improperly.

Some pesticides are acutely toxic (eg parathion) and could cause immediate human or animal poisoning; others have no immediate effect but may have chronic long-term effects (eg dinoseb). No matter what the chemical, the user should at all times use personal protection to minimize exposure. Some pesticides break down rapidly in the environment (eg parathion) while others persist for more than one growing season (eg atrazine). Persons handling pesticides should become familiar with the nature of the pesticides being handled to avoid or minimize soil or environmental contamination, both on and off the farm.

The registered label is a legal document and carries specific instructions on precautions, first-aid, personal protection, storage, and disposal for the pesticide product contained therein. All applicators should read this information before using any pesticide. General information on safety precautions and pesticide toxicity is available in the *OMAF Annual Production Recommendations* (Publication 75, 296, 298, 360, 363, 381, 383). Sometimes precautionary warnings are changed as new toxicological tests are completed, and this information is published as updates that are available through Federal and Provincial Agencies. These precautions will appear on new labels and hence it is important to re-read the label of products that have been on the market for some time.

TRANSPORTATION OF PESTICIDES

The movement of pesticides from vendors to the farm is controlled by the Transportation of Dangerous Goods Act. The following areas apply to pesticides:

Pesticides in small containers Placards are not required to be displayed on a road vehicle transporting up to 500 kg gross weight of all classes of pesticides excluding soil and grain fumigants, however, documentation must be carried. For shipments above this amount placards must be displayed and documentation must be carried and drivers must be adequately trained to safely transport the goods.

Soil and grain fumigants Fumigants belonging to class 2, gases, are not exempt from regulations and vehicles carrying any quantity must be placarded. The product must be labeled, and documentation must accompany the goods.

Pesticides in bulk For the transportation of up to 5000 L of pesticides in bulk, the only requirement is that the tank be placarded with the class symbol.

Haulage distances Farmers hauling pesticides more than 50 km are affected by the regulations whether they carry more or less than 500 kg.

Pesticides should not be transported with food or feed, household furnishings, toiletries, clothes, bedding or similar commodities. Avoid spillage of pesticides during transport. If a spill occurs or if a pesticide is lost seek advice from the Hazardous Containments Co-ordination Board, Ontario Ministry of the Environment (Phone: 416-323-5095).

PLANNING AND RECORD KEEPING

Planning and record keeping go hand in hand. For those growers following a crop rotation, there is a need to plan the type and amounts of herbicides being used to avoid the problem of carry-over residues. Using more than 1.5 kg/ha of atrazine can result in soil residues the next spring that affect susceptible crops. To prevent or minimize pests developing resistance to certain pesticides, a grower needs to carefully plan his fungicide, insecticide, and miticide programs to avoid using one group of pesticide more frequently than recom-

mended. To assist in planning, a record of spray activity should be maintained. These records are useful when: (1) planning subsequent activities such as the next spray; (2) re-entering the treated area; (3) checking interval to harvest; (4) reviewing success or failure in controlling a pest; and (5) planning the next crop.

PURCHASE AND STORAGE OF PESTICIDES

It is wise to purchase only enough pesticide to cover annual needs and avoid large volume carry-over, especially of liquid formulations. Many pesticide formations will deteriorate under low winter or high summer temperatures; therefore, storage sheds containing the temperature sensitive products should be insulated. A special storage shed should be established on the farm, isolated from feed, food, livestock and humans; located above the flood plain; kept under lock and key, and posted with a warning sign on both sides of all access doors. Grant monies can be obtained under OSCAPAP II (see OMAF leaflet) to build a suitable storage facility (see OMAF Factsheet *Farm Storage of Pesticides*, Agdex 607, No. 80-062). Pesticides should be stored in their original containers and not transferred to unlabelled containers.

Unnecessary deaths of livestock have occurred as a result of improper or careless storage of pesticides. This is especially prevalent with granular insecticides that are used for corn rootworm control. Disregard of the safety precautions with these highly toxic substances is not only a menace to livestock but also to farm families and visitors (see OMAF Factsheet *Storing Pesticides on the Farm*, Agdex 607, No. 86-063).

At no time should pesticides be stored in locations where livestock feed, or fruit and vegetables will be stored. Cross-contamination is a real possibility and a single contamination event can cause a loss of buyer confidence or loss of domestic livestock.

HANDLING CONCENTRATES

The label lists the precautions to be followed in handling formulated concentrates. For all pesticides, wear overalls, impermeable gloves and rubber boots. In handling some formulations, goggles and breathing apparatus are required for personal protection.

MIXING AND LOADING OF PESTICIDES

Before mixing and loading, a sprayer should be calibrated using water in a manner prescribed by OMAF Plant Industry Branch staff. Application requirements should be calculated to prepare only as much solution as needed. The mixing of pesticides should be carried out at least 50 m away from the water source as described in OMAF Factsheet *Pesticide Contamination of Farm Water Supplies*, Agdex 607, Order No. 82-032. The use of automatic dispensers is highly recommended. These devices are now available for liquid formulations but not for powder formulations. Grant monies can be obtained under OSCAPAP II (see OMAF leaflet) to have a system on the farm that will separate the filling station from the water supply, and protect against backflow. Monies are also available to protect water supplies in wells by capping, and in ponds by constructing berms.

OSCEPAP II (Ontario Soil Conservation and Environmental Protection Assistance Program II)

Grant monies are available under the OSCEPAP II program to assist farmers in environmental protection. This involves assistance in better storage handling and moving of pesticides while protecting water supplies and minimizing spills. For details contact your OMAF District Office (see OMAF leaflet).

SPRAY APPLICATION

Field application of pesticides should be planned for times when there is little or no wind and spraying should be halted when wind speeds exceed 10 km/hr. To avoid spray drift entering water supplies, a minimum set-back distance should be observed. These distances vary with the pesticide product, type of sprayer, as well as the pressure and nozzles being used and the wind conditions. Using a low pressure ground sprayer in little or no wind can result in spray drift being carried about 3 meters off-target. As the pressure and wind increase, the smaller particles can drift longer distances and affect water supplies or susceptible crops.

Hence larger buffer zones are required. Up to 100 meters may be required with an air-blast sprayer to prevent serious contaminations (see OMAF Factsheet *Pesticide Drift*, Agdex 607, Order No. 76-004). Low volatile formulations of herbicides are recommended. Consult label for specific instructions on buffer zones.

SURPLUS FORMULATED PESTICIDE

To avoid surplus supplies, the best procedure is to avoid purchase of new stocks until surplus pesticide concentrates can be used up on the crops for which they were prescribed. A farmer who is not able to use the material in this manner should try and find another grower who could use his surplus. Otherwise, return the excess to the dealer or manufacturer. To help persons with materials no longer registered (eg DDT) the following standard phrase is appearing on new labels: 'For further information on disposal of unwanted, unused material, consult the regional office of the Environmental Protection Service, Agriculture Canada'.

SURPLUS SPRAY SOLUTION

Excess spray solution should be kept to a minimum by carefully planning the quantities needed for each spray operation. However, there will always be small residual quantities remaining and these should be either sprayed on bare ground at normal rates of application and worked into the surface or applied to the treated crops by a rapid pass so as to apply only a fraction of the original treatment. Most pesticides, including organophosphorus and methylcarbamate insecticides, fungicides, thiocarbamate herbicides and chlorophenoxy acid herbicides rapidly degrade in surface soil at normal rates. Other pesticides like the triazine herbicides can carry-over from one season to the next and hence atrazine should only be put on future corn ground while metolachlor could be placed on corn or soybean land, etc. A minor increase in the amount applied to crops will degrade in time for harvest.

If you are uncertain how to dispose of excess spray, contact the manufacturer.

The most undesirable procedure is to dump surplus spray in one place where it can spread laterally and vertically so as to contaminate the soil and ultimately surface and ground water. Many pesticides dumped this way will destroy microorganisms that normally contribute to the breakdown of chemicals and hence may add to the length of their persistence. Many wells have become contaminated from this practice. Once the groundwater is contaminated, it can remain so for years. Often the farm family may be drinking contaminated water without being aware of the problem.

DISPOSAL OF EMPTY SPRAY CONTAINERS

Empty spray containers may contain a significant quantity of pesticide. Triple or pressure rinse all empty glass, metal or plastic containers with water and add the remnants to the spray tank (see OMAF Factsheet *Pesticide Container Rinsing*, Agdex 607 No 87-057). Dispose of the rinsed containers by puncturing, breaking or crushing. Bury the rinsed container under 50 cm of soil away from any water source or dispose of them with normal garbage in a landfill.

Paper or cardboard containers may be burned. Keep people and livestock away from the smoke. Ensure conditions are such that resultant smoke does not move towards buildings, roads, or outdoor areas frequented by the public.

LANDS NEAR WATER

The pesticides most frequently found in surface waters of ditches, streams and ponds are herbicides. The most frequently found herbicides in rivers and streams used for drinking purposes in Ontario are atrazine, metolachlor and 2,4-D. Some herbicides are rarely, if ever, observed in water (eg butylate, metribuzin, linuron). The herbicides appearing in surface waters are often carried from treated fields in runoff waters during storms. In order to reduce or avoid water contamination, use those herbicides that are incorporated into the soil or those used once the crop has emerged on fields adjacent to streams, rivers and farm ponds.

FISH PONDS

It is possible to raise fish in ponds on farms where pesticides are being applied provided certain precautions are followed. Ponds should be protected against surface runoff waters entering from treated fields. There are certain pesticides that are very toxic to fish in minute amounts, and these should not be used. Endosulfan (Thiodan) is one of the most toxic and residues below 1 part per billion can cause fish mortality. The synthetic pyrethroids are also highly toxic to fish, especially the fry, and should not be applied close enough for them to enter the pond. A large number of pesticides can kill fish if spray drift or surface runoff water carries them to the pond.

BEEKEEPING

It is possible to use pesticides and keep bees, however, precautions must be followed so as not to spray the hives or allow spray drift onto the hives. Many insecticides will kill bees if they fly through a spray operation while foraging. Few

pesticides affect bees once the spray deposits have dried. Carbaryl (Sevin) and carbofuran (Furadan) are extremely toxic to bees primarily because the pesticide can be carried back to the hive with pollen grains and cause mortality in the colony. Bee keepers should not use either of these materials on crops that are foraged by their bees.

BIRDS AND WILDLIFE

While many insecticides appear toxic to birds, cases exist where birds nesting in orchards sprayed with organophosphorus insecticides have come to no harm. In the days of DDT, birds were frequently found dead because of poisoning by DDT or related organochlorine insecticides. During the 1980's, few cases of bird kills have been reported. The cases that have occurred were associated with the use of granular insecticides, rodenticide treated grain or where treated seed has been dumped so as to be available to birds and wildlife. On rare occasions, rain falling shortly after spraying has resulted in toxic pools being formed where waterfowl or even domestic animals have been poisoned.

DOMESTIC LIVESTOCK

After spraying a crop, the prescribed waiting period should be followed before allowing livestock re-entry. This is to avoid poisoning or to avoid residues in animal products like milk or meat. In the past, where organochlorine insecticides were used, the practice of feeding crop residues was actively discouraged because residues accumulated in animal products. Most of the presently used pesticides breakdown rapidly and do not create this problem. Check the label or consult the manufacturer for details. Plant residues are normally ensiled before feeding and this process allows residues to degrade before feeding.

RE-ENTRY INTO TREATED FIELDS

Following the spraying of a crop with a highly toxic insecticide, residues can remain free on plant surfaces and may be picked up on clothing, hands and body surfaces for several hours following application. Individuals have been poisoned as a result of entering treated fields too soon after treatment. As a result, re-entry periods of 24-48 hours have been established for most of the very toxic insecticides. For more information consult the product label or OMAF Publications dealing with Production Recommendations. Persons needing to re-enter treated fields before the specified time period should wear protective clothing (i.e. gloves, rubber boots and coveralls) and upon leaving the area should change and launder their clothing.

PRE-HARVEST INTERVALS

Each pesticide breaks down at a different rate and this can vary for each crop. The label carries the number of days that must elapse between the last spraying of the crop and harvesting. This period allows residues to decline below the Maximum Residue Limits (MRL) laid down in the Canadian Food and Drugs Act and Regulations. Failure to meet these MRL can result in the crop being seized and charges being laid for selling food unfit for human consumption. It is important to

calibrate spray equipment to avoid excessive application rates that lead to such violations.

STORING SPRAYER EQUIPMENT

Many pesticides will persist on spray equipment and may cause exposure to children or other people who climb upon and play around them. Therefore, clean equipment between operations and give a thorough washing once the season is over. Hot water plus a detergent and especially an ammoniacal formulation greatly facilitates the clean-up. Equipment should be stored away from children. Some herbicides are difficult to rinse out of a non-coated metal tank and their residues can lead to damage of a susceptible crop when spraying a second herbicide. It is strongly recommended that separate sprayers be used to apply herbicides and insecticides/fungicides.

CARRY-OVER RESIDUES IN SOIL

Most pesticides break down in the soil before the end of the growing season, however there are a few that will persist into the next season. Atrazine, simazine, metolachlor and terbacil are four herbicides that have been found to persist in Ontario soils so as to affect susceptible crop the next season. Record keeping and planning can readily help to manage this problem.

PESTICIDES USED

Each and every pesticide presents its own set of problems; this section lists some of these problems.

INSECTICIDES AND MITICIDES

1. N-Methylcarbamates Aldicarb (Temik) can be acutely toxic to humans, domestic animals, wildlife and fish and can cause severe poisoning. Being water soluble it can leach to groundwater. Carbaryl (Sevin) and carbofuran (Furadan) are highly toxic to bees.

2. Organochlorines Lindane, endosulfan (Thiodan), dicofol (Kelthane), and methoxychlor can be very toxic to fish. Lindane appears toxic to young domestic animals especially calves, dogs and cats.

3. Organophosphorus Many of these compounds are very acutely toxic to humans, domestic animals, wildlife and fish and can cause severe poisoning. In particular, fonofos (Dyfonate), mevinphos (Phosdrin), phorate (Thimet), terbufos (Counter), parathion, and methamidophos (Monitor) are very toxic and have caused severe poisonings. Most of the organophosphorus insecticides break down rapidly within 2

to 14 days in soil and in less than 7 days in water. Personal protection including respirators are needed when preparing and applying the above compounds as well as azinphosmethyl (Guthion), and demeton (Systox). Observe the prescribed periods before re-entering a treated field and the number of days before harvesting.

4. Synthetic Pyrethroids These compounds have low toxicity to humans and mammals but are very toxic to aquatic invertebrates and fish and can persist in sediments. Compounds in this class include permethrin (Ambush, Pounce), fenvalerate (Belmark), cypermethrin (Cymbush, Ripcord), and deltamethrin (Decis).

FUNGICIDES

Fungicides Most fungicides degrade rapidly in soil and water; most are of low acute toxicity to humans and domestic animals. Chronic long term effects have been noted with some fungicides, and exposure should be minimized. Residues of EBDC fungicides (maneb, mancozeb, metiram, zineb) remaining on food can form ETU (ethylene thiourea) on cooking. The days between application and harvest should be strictly observed to avoid residues in excess of MRL.

HERBICIDES

1. Bipyrilidium Paraquat (Gramoxone) and diquat (Reglone) are rapidly absorbed and tightly bound to soil where they remain undegraded. Paraquat can be lethal if ingested or inhaled.

2. Chloroacetamides Metolachlor (Dual) is relatively soluble in water and can persist from one season to the next and become a contaminant of water.

3. Chlorophenoxy Acids 2,4-D, 2,4-DB, MCPA and other chlorophenoxy herbicides can readily drift and some volatilize during and after spraying and cause severe injury on susceptible crops. These herbicides can be carried in runoff water from treated grassed areas to enter wells, ponds and ditches and contaminate water supplies and severely affect greenhouse plants.

4. Phenylureas and Uracils Diuron (Karmex) and tebacil (Sinbar) can persist up to one year and carry-over can affect susceptible crops.

5. Triazines Atrazine (AAtrex) and simazine (Princep) persist in soil from one season to the next and may cause damage to susceptible crops. On Ontario soils atrazine is readily carried to surface or well waters.